August 6, 2001

INFORMATION DISCLOSURE STATEMENT letter

To Whom it May Concern:

The following documents are included in form PTO/SB/08A Information Disclosure Statement by Applicant as a bibliography for the application having the following title and applicant.

Title: Symbol Constellations Having Second-Order Statistics with Cyclostationary Phase

Applicant: Charles D. Murphy

Here, the documents are discussed as they relate to the specification and claims of the application.

The following three documents (Serpedin and Giannakis 1998, Giannakis 1997, and Tsatsanis and Giannakis 1997) relate to transmitter-induced cyclostationarity. The main focus of these papers is on conjugated second moments that are cyclostationary. The principal ways of introducing such cyclostationarity are by modulating the power of transmitted symbol constellations and by coding to introduce correlation between successive symbols. Conjugated second moments always have a phase of zero, which is not the case in the invention of the application. The paper (Serpedin and Giannakis 1998) has a very brief mention of using non-conjugated second moments. The differences between the invention of the application and the work in (Serpedin and Giannakis 1998) are discussed in the application. Note that there are other papers in the technical literature on transmitter-induced cyclostationarity.

E. Serpedin and G.B. Giannakis, "Blind Channel Identification and Equalization with Modulation-Induced Cyclostationarity," IEEE Transactions on Signal Processing, Vol. 46, No. 7, pp. 1930-1944, July 1998.

G.B. Giannakis, "Filterbanks for Blind Channel Identification and Equalization," IEEE Signal Processing Letters, Vol. 4, No. 6, pp. 184-187, June 1997.

M.K. Tsatsanis and G.B. Giannakis, "Transmitter Induced Cyclostationarity for Blind Channel Equalization," IEEE Transactions on Signal Processing, Vol. 45, No. 7, pp. 1785-1794, July 1997.

The following three documents (Hatzinakos and Nikias 1994, Tong, Xu, and Kailath 1994, and Papadias and Slock 1999) discuss blind identification and equalization of linear channels using higher-order statistics (Hatzinakos and Nikias 1994) and using fractional sampling (Tong, Xu, and Kailath 1994, and Papadias and Slock 1999). There are many other papers in the literature that discuss advantages and drawbacks of higher-order statistics and fractional sampling in channel identification and equalization.

D. Hatzinakos and C.L. Nikias, "Blind Equalization Based on Higher-Order Statistics (H.O.S.)," Blind Deconvolution, S. Haykin (ed.), Englewood Cliffs: PTR Prentice Hall, 1994.

L. Tong, G. Xu, and T. Kailath, "Blind Identification and Equalization Based on Second-Order Statistics: A Time Domain Approach," IEEE Transactions on Information Theory, Vol. 40, No. 2, pp. 340-349, March 1994.

C.B. Papadias and D.T.M. Slock, ``Fractionally Spaced Equalization of Linear Polyphase Channels and Related Blind Techniques based on Multichannel Linear Prediction," IEEE Transactions on Signal Processing, Vol. 47, No. 3, pp. 641-654, March 1999.

The following two papers (Furuskar, Mazur, Muller, and Olofsson 1999 and Boss, Kammeyer, and Petermann 1998) discuss channel equalization in packet-based wireless communications. The papers examine channel variation with time, training-based equalization, and the possibilities of recovering training symbol slots for use in sending data when blind or semi-blind channel equalization is used. The material in these papers motivates using the invention of the application in actual systems such as mobile phone networks and also describes some of the problems that must be solved in order to do so.

A. Furuskar, S. Mazur, F. Muller, and H. Olofsson, "EDGE: Enhanced Data Rates for GSM and TDMA/136 Evolution," IEEE Personal Communications, Vol. 6, No. 3, pp. 56-66, June 1999.

D. Boss, K.-D. Kammeyer, and T. Petermann, "Is Blind Channel Estimation Feasible in Mobile Communication Systems? A Study Based on GSM," IEEE Journal on Selected Areas in Communications, Vol. 16, No. 8, pp. 1479-1492, October 1998.

The following two books (Proakis 1995 and Freeman 1998) are general textbooks on digital communications techniques. They describe channel modeling, channel identification and equalization, common symbol constellations, and various other communications issues.

J.G. Proakis, Digital Communications, New York: McGraw-Hill, 1995.

R.L. Freeman, Telecommunications Transmission Handbook, 4th Ed., New York: John Wiley & Sons 1998.

The following book (Gardner 1994) discusses in great detail cyclostationarity and its applications in practical areas such as digital communications and other types of signal processing.

W.A. Gardner (ed.), Cyclostationarity in Communications and Signal Processing, New York: IEEE Press, 1994.

The following book (Bendat 1990) discusses the identification of nonlinear systems using random data. The book relates to seismic signal processing, acoustic signal processing, and also to digital communications for certain types of nonlinear channel models.

J.S. Bendat, Nonlinear System Analysis and Identification from Random Data, New York: John Wiley and Sons, 1990.

The following three papers (Sato 1975, Godard 1980, and Treichler and Agee 1983) are early works on blind equalization techniques that make implicit use of higher-order statistics. There are many more-recent papers which investigate the shortcomings of these techniques and recommend various improvements.

Y. Sato, ``A Method of Self-Recovering Equalization for Multilevel Amplitude-Modulation Systems," IEEE Transactions on Communications, Vol. COM-23, pp.679-682, June 1975.

D.N. Godard, ``Self-Recovering Equalization and Carrier Tracking in Two-Dimensional Data Communication Systems," IEEE Transactions on Communications, Vol. COM-28, pp. 1867-1875, November 1980.

J.R. Treichler and B.G. Agee, ``A New Approach to Multipath Correction of Constant-Modulus Signals," IEEE Trans. on Acoustics, Speech, and Signal Processing, Vol. 31, No. 2, pp. 459-471, April 1983.

The following two papers (Gomes and Barroso 1997 and Theodoridis, Cowan, Callender, and See 1995) discuss some nonlinear channel equalizers, with (Cowan, Callendar, and See 1995) investigating equalization of nonlinear channels. There are many other papers on training-based equalization of nonlinear channels and nonlinear equalization of linear channels.

J. Gomes and V. Barroso, "Using an RBF Network for Blind Equalization: Design and Performance Evaluation," Proceedings of ICASSP '97, 1997, pp. 3285-3288.

S. Theodoridis, C.F.N. Cowan, C.P. Callender, and C.M.S. See, "Schemes for Equalisation of Communication Channels with Nonlinear Impairments," IEE Proceedings on Communications, Vol. 142, No. 3, pp. 165-171, June 1995.

The following paper (Saleh 1981) contains a study of the amplification characteristics of traveling-wave tube amplifiers. The author develops a model of traveling-wave tube amplifier nonlinearity that consists of a memoryless amplitude nonlinearity and a memoryless phase nonlinearity both of which are functions of input amplitude. Many subsequent papers have used this model, particularly in satellite communications where traveling-wave tube amplifiers are used.

A.M. Saleh, "Frequency Independent and Frequency Dependent Nonlinear Models of TWT Amplifiers," IEEE Transactions on Communications, Vol. COM-29, pp. 1715-1720, November 1981.

The following paper (Dardari, Tralli, and Vaccari 1998) contains a model of a solid-state power amplifier nonlinearity. The saturation of power amplifiers near their power supply limits is a topic of many other papers, and development of highly linear power amplifiers is the subject of a great deal of analog circuit design work.

D. Dardari, V. Tralli, and A. Vaccari, "A Novel Low Complexity Technique to Reduce Non-linear Distortion Effects in OFDM Systems," Proceedings of IEEE PIMRC '98, Boston, September 1998.

The patent (US patent 4,922,506) issued to McCallister and Shearer in 1990 contains a very broad independent method claim on using "a cyclostationary signal" in order "to estimate the transfer characteristics of [a] medium". In further claims and in the specification the patent indicates very clearly that the invention is intended as a matched filter to recover a baseband signal when a spread-spectrum modulation technique

This concludes this INFORMATION DISCLOSURE STATEMENT letter.

Sincerely,

Charles D. Murphy

Charles D. Murphy

1816 West Wilson Avenue #3
Chicago, IL 60640

RS
#2

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(use as many sheets as necessary)

Sheet	1	of	3

Complete if Known	
Application Number	
Filing Date	
First Named Inventor	Charles D. Murphy
Group Art Unit	
Examiner Name	
Attorney Docket Number	

JC857 U.S. PTO
09/928897
08/14/01

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	U.S. Patent Document Number	Kind Code[2] (if known)	Name of Patentee or Applicant of Cited Document	Date of Publication of Cited Document MM-DD-YYYY	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		4922506		McCallister, R.D. and Shearer, D.D.	05-01-1990	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Office[3]	Number[4]	Kind Code[5] (if known)	Name of Patentee or Applicant of Cited Document	Date of Publication of Cited Document MM-DD-YYYY	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]

Examiner Signature		Date Considered	

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Sheet 2 of 3

Complete if Known	
Application Number	
Filing Date	
First Named Inventor	
Group Art Unit	
Examiner Name	
Attorney Docket Number	

OTHER PRIOR ART – NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
		E. SERPEDIN + G.B. GIANNAKIS, "Blind Channel Identification with Modulation-Induced Cyclostationarity" IEEE Trans. on Signal Processing, Vol 46, No 7, pp.1930-1944, July 1998.	
		G.B. GIANNAKIS, "Filterbanks for Blind Channel Identification and Equalization", IEEE Signal Processing Letters, Vol. 4, No. 6, pp. 184-187, June 1997	
		MK TSATSANIS + GB GIANNAKIS, "Transmitter Induced Cyclostationarity for Blind Channel Equalization," IEEE Trans. on Signal Processing, Vol. 45, No 7, pp1785-1794 July 1997.	
		D HATZINAKOS and CL NIKIAS, "Blind Equalization Based on Higher-Order Statistics (HOS)" in Blind Deconvolution, ed. S. Haykin, Englewood Cliffs: PTR Prentice Hall 1994	
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		A. FURUSKAR, S. MAZUR, F. MULLER, and H. OLOFSSON, "EDGE: Enhanced Data Rates for GSM and TDMA/136 Evolution", IEEE Personal Communications, Vol. 6, No. 3, pp. 56-66, June 1999	
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		J.G PROAKIS, "Digital Communications," New York: McGraw Hill, 1995	
		R.L. FREEMAN, "Telecommunications Transmission Handbook", 4th edition, New York: John Wiley & Sons, 1998.	
		W.A. GARDNER (editor) "Cyclostationarity in Communications and Signal Processing," New York: IEEE Press, 1994.	

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		JS BENDAT, "Nonlinear System Analysis and Identification from Random Data" New York: John Wiley & Sons, 1990.	
		Y. SATO, "A Method of Self-Recovering Equalization for Multilevel Amplitude Modulation Systems", IEEE Trans. on Communications, Vol. COM-23, pp. 679-682, June 1975.	
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		JR TREICHLER + BG AGEE, "A New Approach to Multipath Correction of Constant-Modulus Signals," IEEE Trans. on Acoustics, Speech, + Signal Processing, Vol. 31, No 2, pp. 459-471, April 1983.	
		J. GOMES + V. BARROSO, "Using an RBF Network for Blind Equalization: Design and Performance Evaluation." Proceedings of ICASSP 1997, pp. 3285-3288.	
		S THEODORIDIS, CFN COWAN, CP CALLENDER, and CMS SEE, "Schemes for Equalisation of Communication Channels with Nonlinear Impairments", IEE Proceedings on Communications, Vol 142, No 3, pp. 165-171, June 1995.	
		A.M. SALEH, "Frequency Independent and Frequency Dependent Nonlinear Models of TWT Amplifiers", IEEE Trans. on Communications, Vol. COM-29, pp. 1715-1720, ~~December~~ November 1981.	
		D. DARDARI, V. TRALLI, and A. VACCARI, "A Novel Low Complexity Technique to Reduce Nonlinear Distortion Effects in OFDM Systems," Proceedings of IEEE PIMRC 1998, September 1998.	

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